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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/686,551	10/14/2003	Thomas David Lokovic	021751-001710US	3476

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EXAMINER	
NGUYEN, KIMBINH T	
ART UNIT	**PAPER NUMBER**
2671	

DATE MAILED: 05/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/686,551	LOKOVIC ET AL.	
	Examiner	Art Unit	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-57* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *16-57* is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to amendment filed 02/23/05.

2. Claims 1-57 are pending in the application.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-15 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 10 of U.S. Patent No. 6,760,024. Although the conflicting claims are not identical, they are not patentably distinct from each other because the application claim 1 comprising the same steps of the patent claim 1 but the application claim 1 does not comprise the modified step "wherein said visibility function accounts for light attenuation due to volumetric and surface primitives in said object scene", this step is only an alternative step and it would have been obvious to one of ordinary skill in the art at the time the invention was made to not include this step in the application claim 1 and the scope of the invention would not change.

Claims 2-14 depend upon claim 1 and are rejected under the same reasons set forth in claim 1 above.

Claim 15 comprising the same steps of the patent claim 10 but the application claim 1 does not comprise the modified step "wherein said visibility function accounts for light attenuation due to volumetric and surface primitives in said object scene", claim 15 is rejected under the same reasons set forth in claim 1 above.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 4, 5, 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Snyder et al. (5,870,097).

Claim 1, Snyder et al. discloses determining visibility function of depth with respect to a given light source and object scene (col. 2, lines 38-44; fig. 32); storing the visibility function (z value) in a map location (col. 3, line 12); rendering a geometric element, the rendering comprising: transforming the geometric element to yield map locations and depths (col. 93, lines 15-20); evaluating (computing) the visibility function (z values) at the map locations and depths to yield a fractional light contribution from the light source (col. 101, line 66 through col. 102, line 3). Snyder does not teach evaluating the visibility function at the map locations and depths to yield a fractional

light; however, Snyder discloses after transforming pixel data, computing the color and alpha (visibility function) in output device coordinates based on the Gsprite transforms. The process involves determining the color and alpha at a pixel location (col. 17, lines 5-13); the initial alpha is set to 1, meaning full transparency. The data for each layer is as follow: fragment 0, alpha = 0.5, coverage mask; fragment 1, alpha=0.3 (col. 73, lines 29-34); furthermore, Snyder teaches if the geometry does not have static transparency across illumination passes, then a color-opacity operation is used. That is, the color-opacity operation will clear the color values in every pixel fragment (by setting them to zero), while clearing the opacities in each fragment (by setting them to one). The opacities cleared are the modeling opacities rather than transparency due to partial coverage of the fragment. (col. 85, lines 47-67) and attenuated between 1 and 0, this procedure creates a fractional light contribution from the light source, and Snyder suggested the fraction is one-half (semitransparent). Snyder also teaches a method for shadowing a scene while rendering geometric primitives by multiple-pass rendering which including computing the closest depth values from the light source for each elements in the shadow depth map and applying the shadow depth map to the image to determine the extent to which pixel values in the image are shadowed and unshadowed portions, and the depth values can be a visibility function at the map locations and the depths to determine which portions are shadowed and unshadowed (visible portions) in the image (col. 101, line 38 through col. 2, line 22). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the Snyder's teaching for computing the closest depth values (evaluating

the visibility function) from the light source for each elements in the shadow map and applying the shadow depth to the image to determine the extent to which pixel values in the image are shadowed and unshadowed portions.

Claims 2, 4, 5, 12 and 13, Snyder et al. teaches the geometric element is a surface, (col. 1, lines 42-43); projecting sample points of the map locations from the camera's perspective to the coordinate system associated with the light source (col. 91, lines 25-29; compressing the visibility function (compressed data) (col. 20, lines 33-37); storing a tile (or chunk) of map locations in a cache (col. 35, lines 10-14); resizing (adaptive sizing) a cache line in accordance with the size of the tile of map locations (col. 35, lines 15-23); filtering the transmittance functions (col. 5, lines 4-7).

Claim 15, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Snyder et al. teaches a computer readable medium (col. 11, lines 17-51).

7. Claims 3, 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Snyder et al. (5,870,097) in view of Jenkins (6,111,582).

Claims 3, 6, 7, 8, Snyder et al. does not disclose volumetric element; however, Jenkins discloses the geometric element is a volumetric primitive (voxel) (col. 5, lines 22-25; fig. 9); storing a list of vertices (col. 84, lines 2-4); performing a binary search (comparing between zero and one) of the list of vertices (col. 84, lines 22-50); performing a linear search (the primitive's vertices are checked on the source vertex list) of the list of vertices (col. 84, lines 39-50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the Jenkin's teaching into the Snyder's method for utilizing volumetric element into shadow depth map,

because the use of bounding volumes or spatial subdivision of the database it would reduce the computational cost of the geometry and also improve visibility tracing methods (col. 13, lines 19-22).

Claim 9, Snyder and Jenkins fail to suggest utilizing a pointer to initiate the search from the list of vertices most recently accessed in a prior search; however, in a computer graphics systems, the use of pointer such as a mouse pointer to initial the search is the most common, because depending on the location of the mouse pointer and the operation of the program with which it is working, the area of the screen where the mouse pointer appears serves as the target for an action such as searching. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the pointer, because the pointer is an identifier that indicates the address or storage location of an data item, this would allow the user easier for searching.

8. Claims 10, 11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Snyder et al. (5,870,097) in view of Foran et al. (5,742,749).

Claims 10, 11 and 14, Snyder et al. discloses compressing the result of the averaging (col. 20, lines 33-37); Snyder et al. does not suggest averaging visibility functions; however, Foran et al. discloses generating resolutions of maps by averaging visibility functions of adjacent map locations (col. 2, lines 33-40); the visibility function stores light attenuation from a non-point (i.e., area or distance) light source (col. 12, lines 16-19). It would have been obvious to one of ordinary in the art at the time the invention was made to utilize the Foran's teaching into the Snyder's method for utilizing

visibility functions into shadow map, because it would improve a rendering method of a geometric model, creating a realistic shadow effect (col. 2, lines 42-45).

Allowable Subject Matter

9. Claims 16-57 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior art does not teach determining a first visibility function based on information associated with the first ray transmittance function and the second ray transmittance function; wherein the determining a first ray transmittance function includes: processing information associated with the first ray; determining a first surface transmittance function based on information associated with the first ray; determining a first volume transmittance function based on information associated with the first ray; processing information associated with the first surface transmittance function and the first volume transmittance function; determining the first ray transmittance function based on information associated with the first surface transmittance function and the first volume transmittance function; determining a first visibility value associated with the first location based on information associated with the first shadow map and the first location; wherein the first visibility value is capable of being equal to any value smaller than or equal to a first value and larger than or equal to a second value, the first value being associated with being fully lit by the first light source, and second value being associated with being completely unlit by the first light source.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

10. Applicant's arguments filed 02/23/05 have been fully considered but they are not persuasive, because, claim 1, Snyder does not teach evaluating the visibility function; however, Snyder teaches a method for shadowing a scene while rendering geometric primitives by multiple-pass rendering which including computing the closest depth values from the light source for each elements in the shadow depth map and applying the shadow depth map to the image to determine the extent to which pixel values in the image are shadowed and unshadowed portions, and the depth values can be a visibility function at the map locations and the depths to determine which portions are shadowed and unshadowed (visible portions) in the image. For these reasons, the rejections of claims 1-15 are maintained. Claims 1-15 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 10 of U.S. Patent No. 6,760,024 also maintained.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimbinh T. Nguyen whose telephone number is (571) 272-7644. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Friday from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (571) 272-7653. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

May 12, 2005

/Kimbinh Nguyen/

KIMBINH T. NGUYEN
PRIMARY EXAMINER